

The burden of preterm births in low and middle income countries

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Preterm births

Topics covered in this presentation

- The importance of identifying preterm babies
- Difficulties in the study of preterm births: assessment of gestational age and defining preterm subtypes
- Preterm birth as a cause of death and sequelae
- Trends in prevalence in selected countries
- What do we know on the number of preterm births in low and middle income countries?

Messages that I hope to deliver

- Preterm birth is a huge public health problem in LMICs
- We need to know who is preterm
- It is impossible to have this information, in the present world situation
- There are possible alternatives to estimate prevalence of small babies at country and regional level

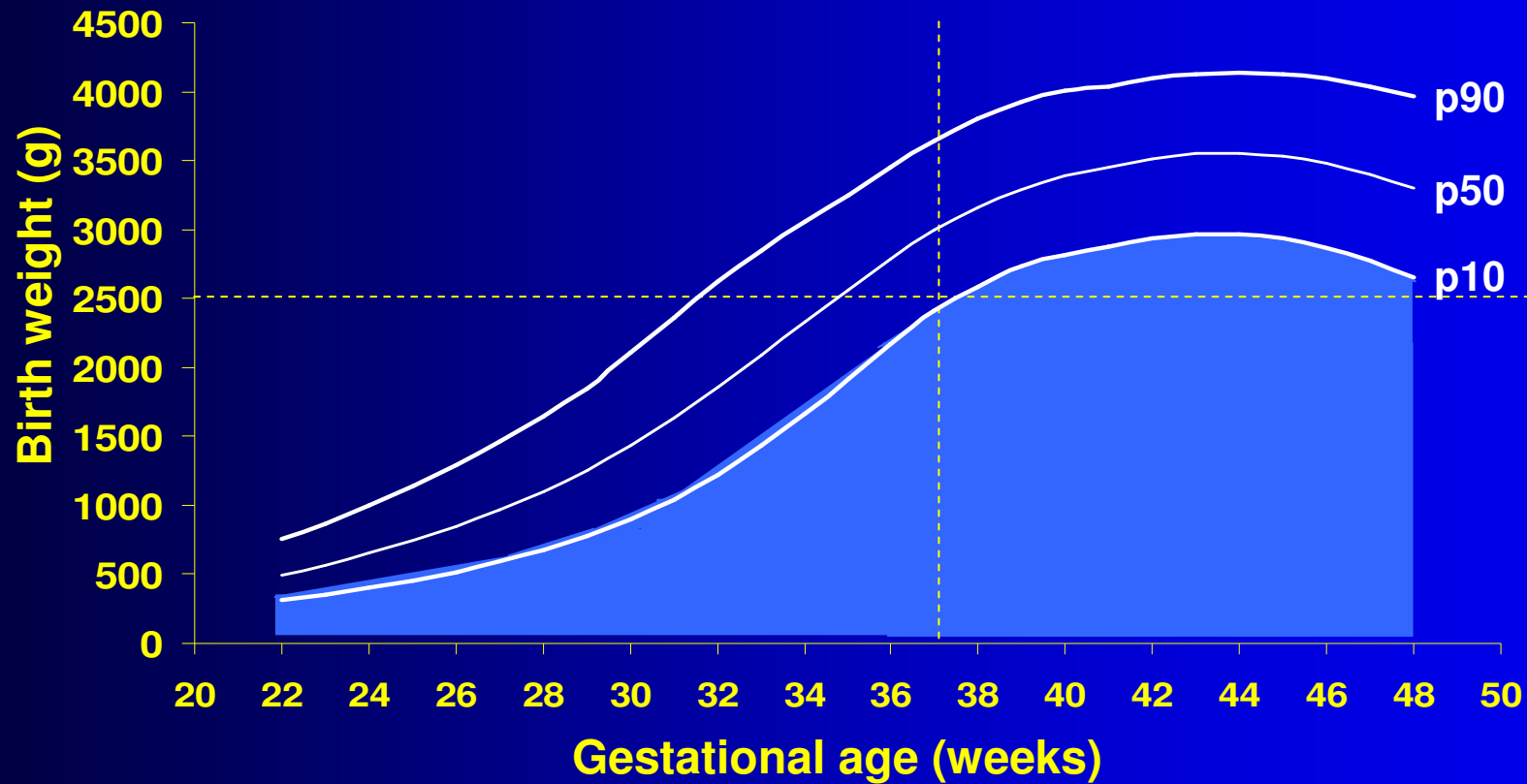
Definition of preterm birth

Less than 37 completed weeks of gestation

Why do we need to know if a baby is preterm and how many babies are preterm?

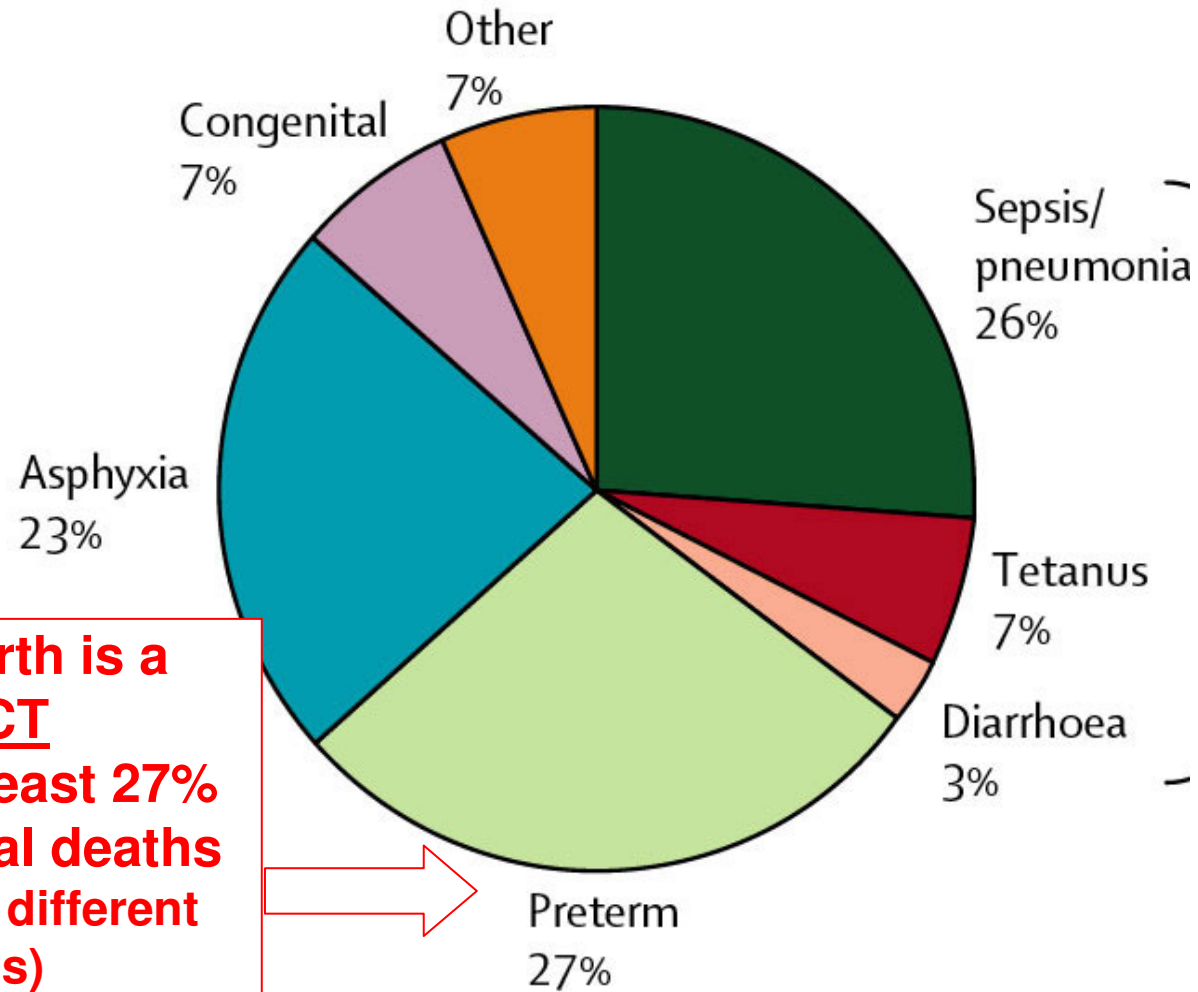
- Individual care – increased risk
- Public health perspective
 - provision of health care facilities: NICUs, incubators, etc
 - monitoring of population health

Birth weight for gestational age California, 1970-76



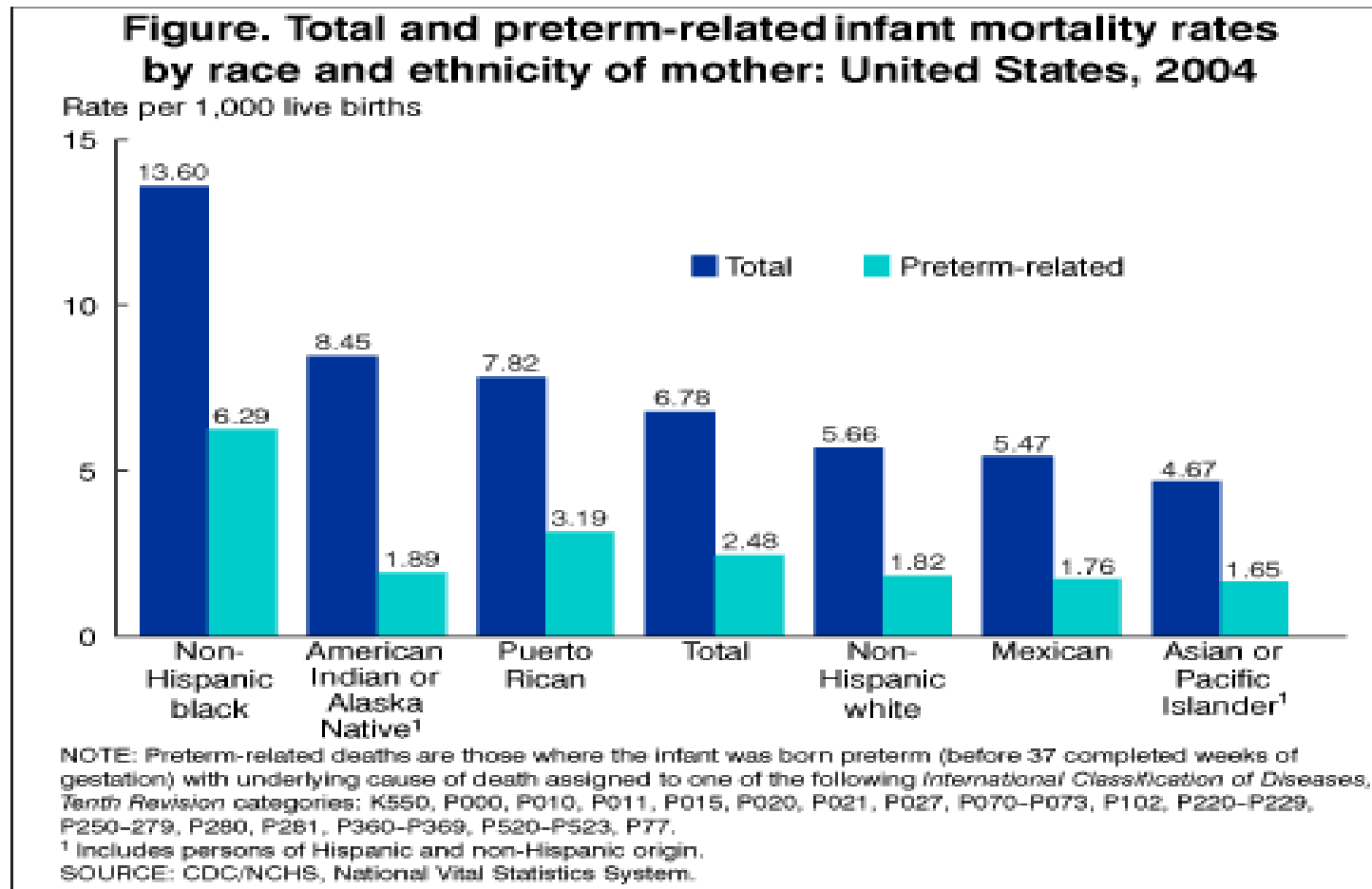
Williams et al, 1982

Preterm birth as a direct cause of death



Preterm birth is a DIRECT cause of at least 27% of all neonatal deaths (22 to 41% in different regions)

Preterm-related infant mortality. USA, 2004



Proportion of births by birth weight and gestational age. Pelotas, Brazil, 2004 (n=4231)

Birth weight (g)	Gestational age (weeks)	
	< 37	37 +
2500 +	8%	82%
< 2500	7%	3%

Proportion of births by birth weight and gestational age. Pelotas, Brazil, 2004 (n=4231)

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10%

Proportion of births by birth weight and gestational age. Pelotas, Brazil, 2004 (n=4231)

Birth weight (g)	Gestational age (weeks)	
	< 37	37 +
2500 +	15%	82%
< 2500	7%	10% 3%

Infant mortality rates (/1000 live births)
by birth weight and gestational age.
Pelotas, Brazil, 2004

Birth weight (g)	Gestational age (weeks)	
	< 37	37 +
2500 +	18	8
< 2500	157	29

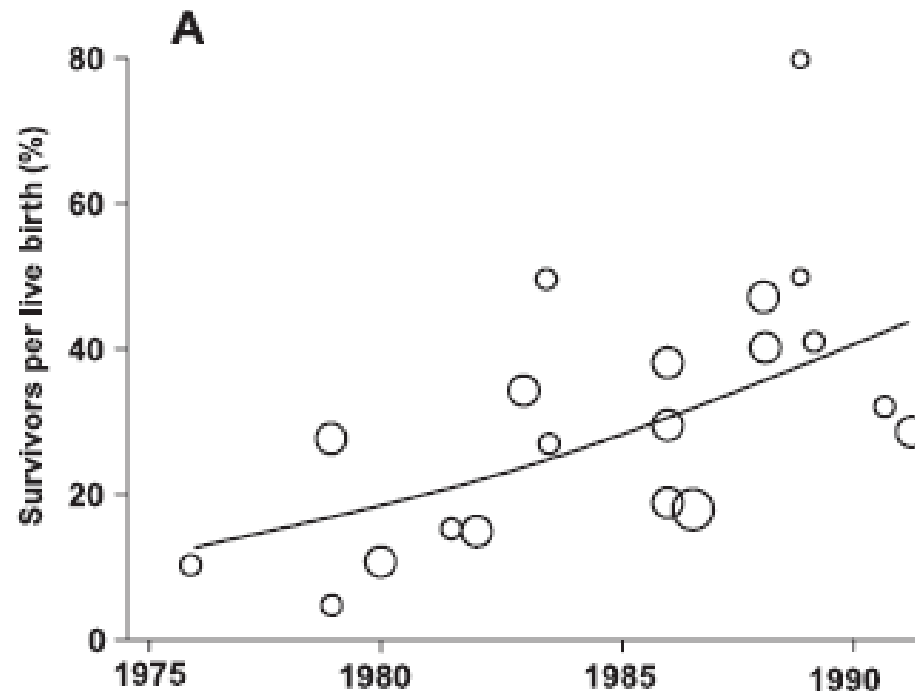
Proportion of infant deaths by birth weight and gestational age. Pelotas, Brazil, 2004

Birth weight (g)	Gestational age (weeks)	
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< 2500	55%	5%

Proportion of infant deaths by birth weight and gestational age. Pelotas, Brazil, 2004

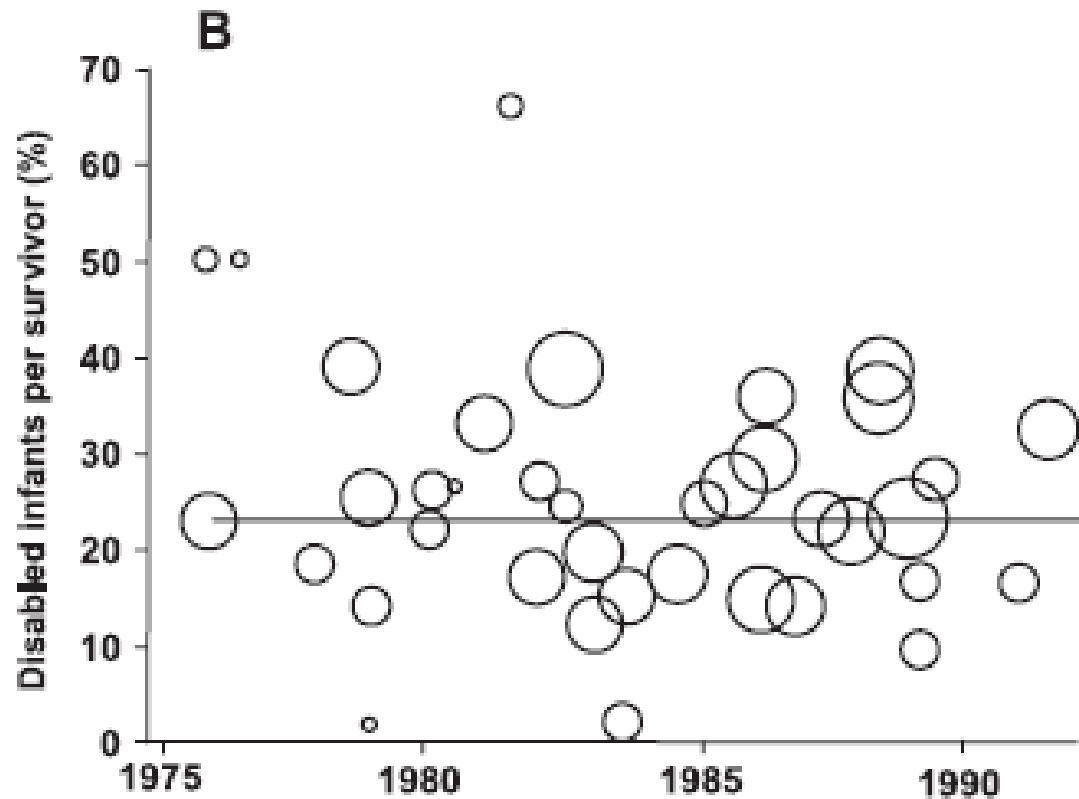
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Survivors per live birth (%) among preterm babies weighing less than 800 g. USA



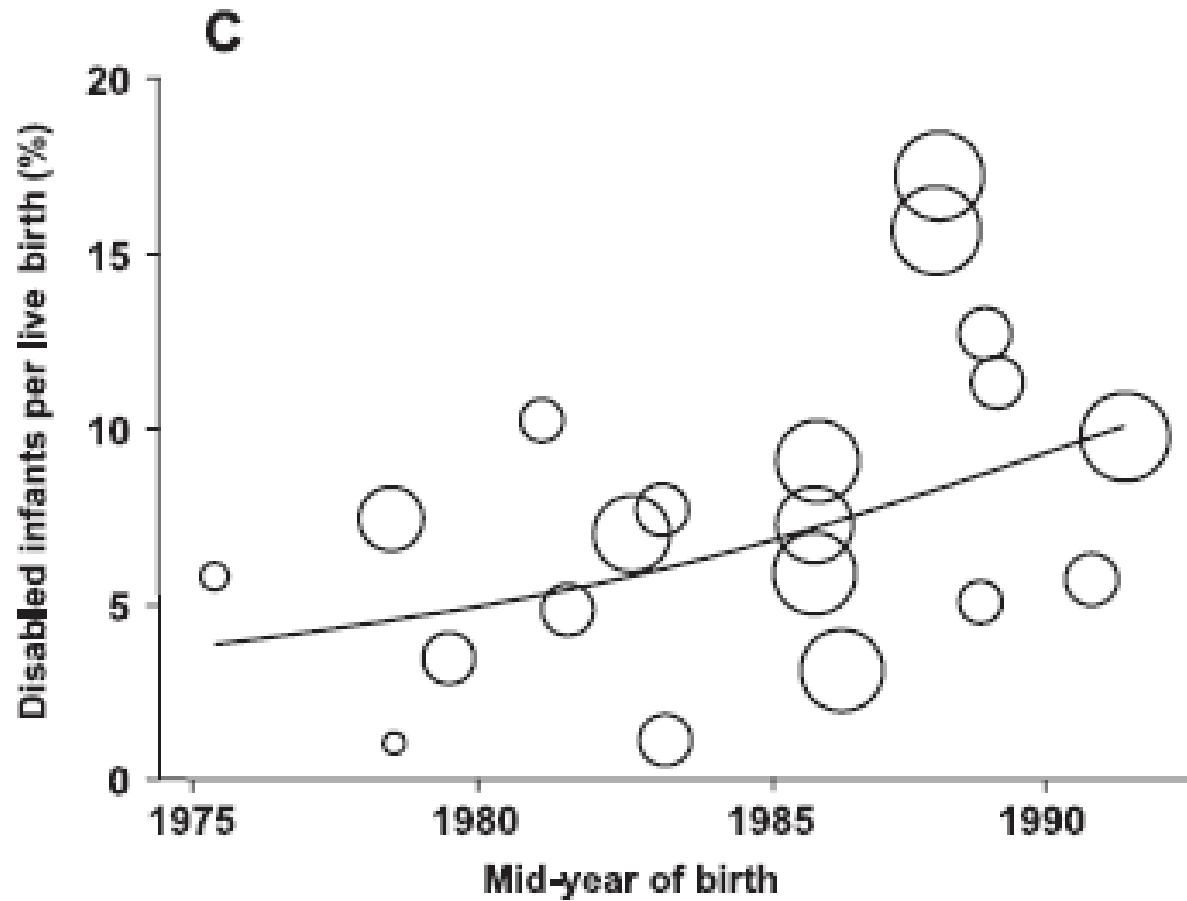
Lorenz, 1998

Disabled infants per survivors (%) among preterm babies weighing less than 800 g. USA



Lorenz, 1998

Disabled infants per live birth (%) among preterm babies weighing less than 800 g. USA



Lorenz, 1998

Difficulties in the study of preterm births

- Assessment of gestational age
- Identify subtypes of preterm births

Gestational age assessment

Methods	Accuracy	Availability
Surrogates (weight, chest, head circumference)	Little accuracy. Birth weight works well in small babies	Births with skilled attendance
Last menstrual period	Unknown or inaccurate in 10-20%	Widely used
Clinical assessment	\pm 10-16 days, less accurate in low gestational ages	Mainly neonatal units or special studies
Early ultrasound	Gold standard \pm 7 days in 1st trimester	High income countries, some middle income countries

Preterm birth is not a single entity

- Subtypes according to maternal health status and what started preterm labor or produced delivery
- Subtypes have different prognosis

Subtypes of preterm births

Situation leading to preterm delivery	Medical or obstetrical condition	
	No	Yes
Spontaneous preterm labor		
Premature rupture of membranes (PROM)		
Interruption – induction or cesarean section		

Subtypes of preterm births in selected South American hospitals, 1996-2003

Situation leading to preterm delivery	Medical or obstetrical condition	
	No	Yes
Spontaneous preterm labor	56%	9%
Premature rupture of membranes (PROM)	15%	1%
Interruption – induction or cesarean section	11%	8%

Trends in preterm births

Recent increases in some high income (US, Denmark, Australia) and middle income countries (Argentina, Brazil, Russia).

Unknown trends for low income countries

Trends in preterm births and LBW in the United States, 1990-2006

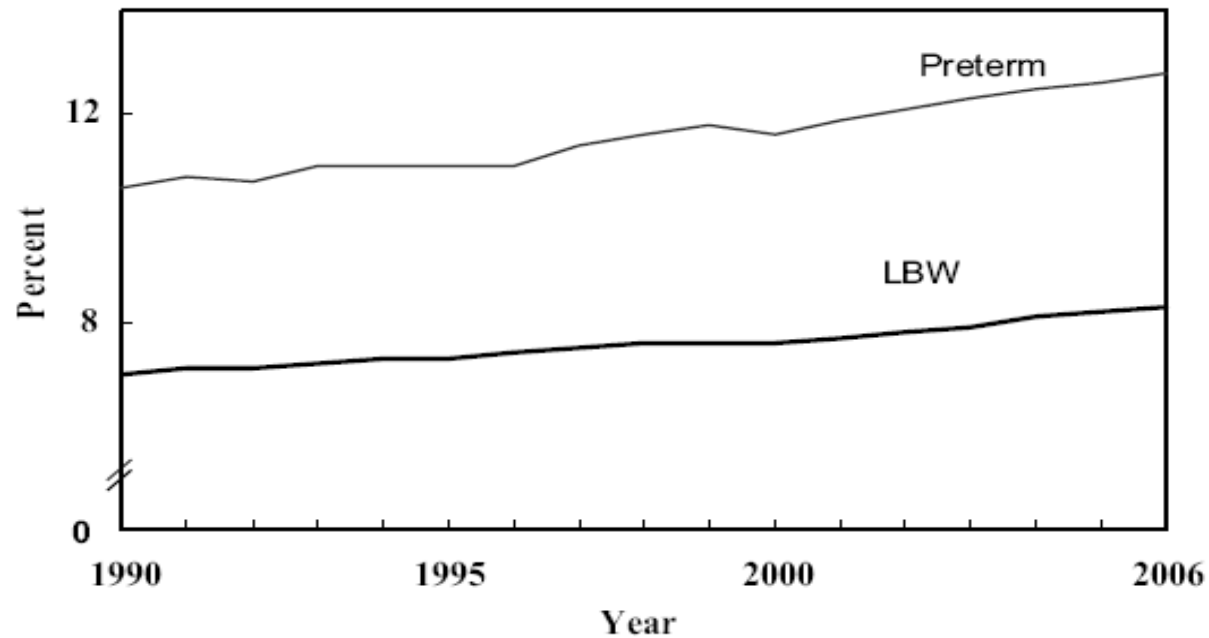
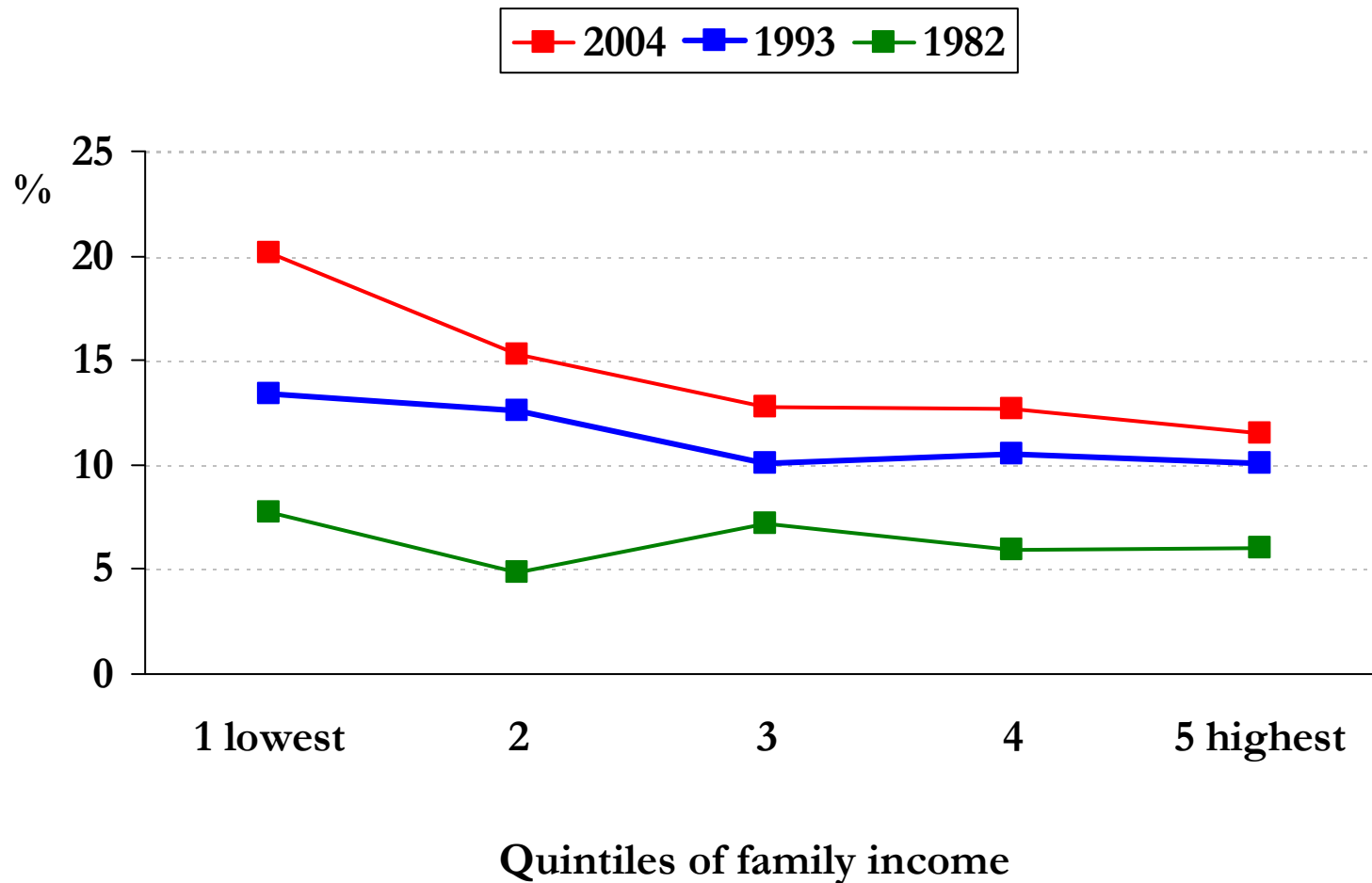


FIGURE 3
Percent preterm and percent LBW: United States, 1990–2006 (preliminary). LBW is <2500 g, and preterm is <37 completed weeks of gestation.

Preterm births by family income. Pelotas, Brazil, 1982, 1993 e 2004



What is the number of preterm births in low and middle income countries?

Number of livebirths by region

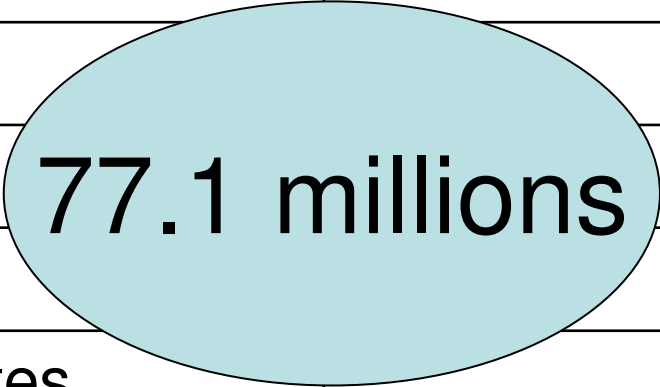
Country groups	Livebirths (millions)
High income countries	11.0
Low and middle income countries	
Latin America and Caribbean	11.4
South Asia	37.9
East Asia and Pacific	29.7
Middle East and North Africa	8.9
CEE/CIS	6.1
Sub-Saharan Africa	29.9
All LMICs	124.0
World	135.0

Top ten countries in number of births

Country	Births (millions)
India	27.2
China	17.3
Nigeria	5.9
Indonesia	4.4
Pakistan	4.3
United States	4.2
Bangladesh	4.0
Brazil	3.7
Ethiopia	3.1
DR Congo	3.0

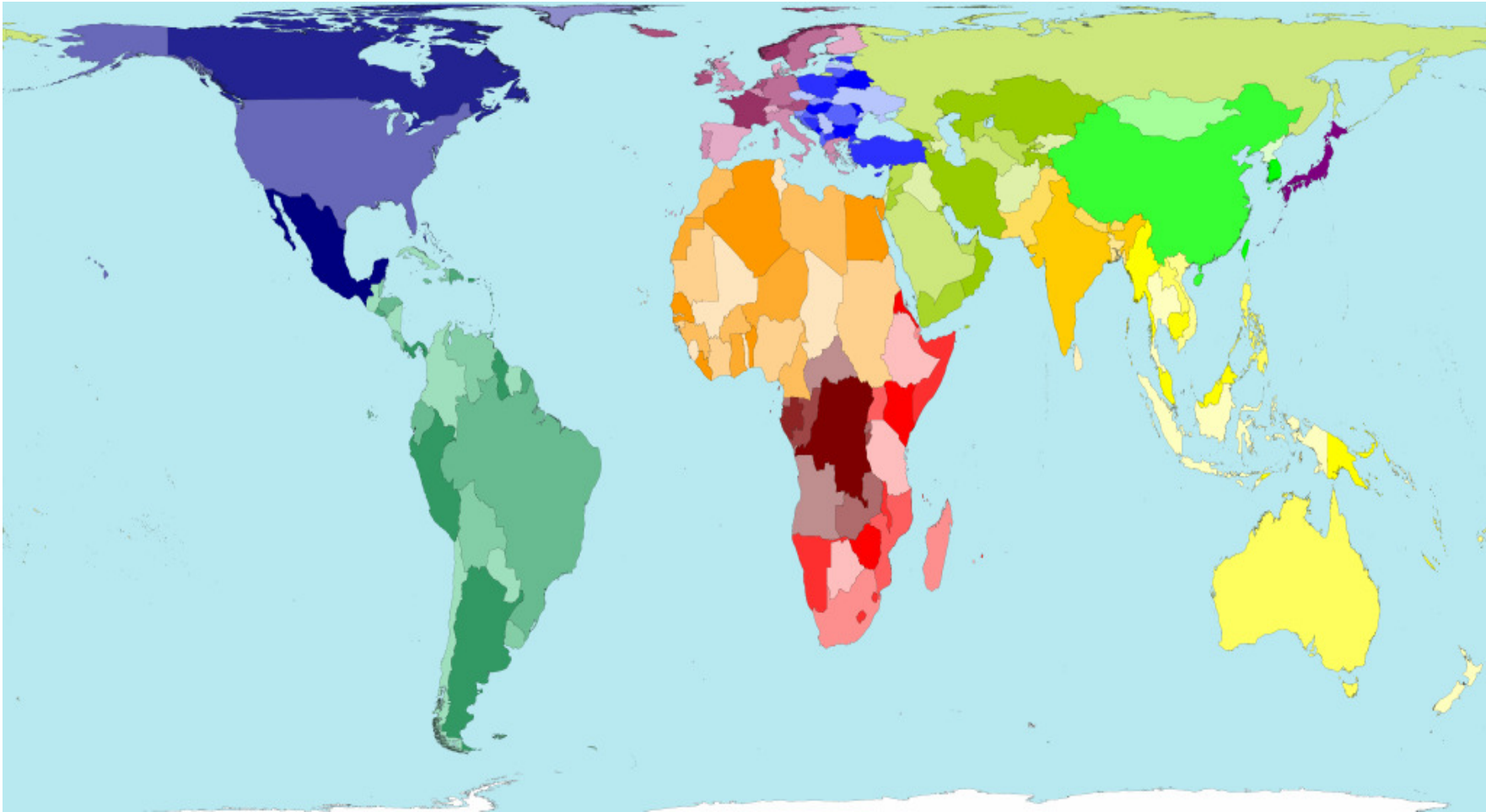
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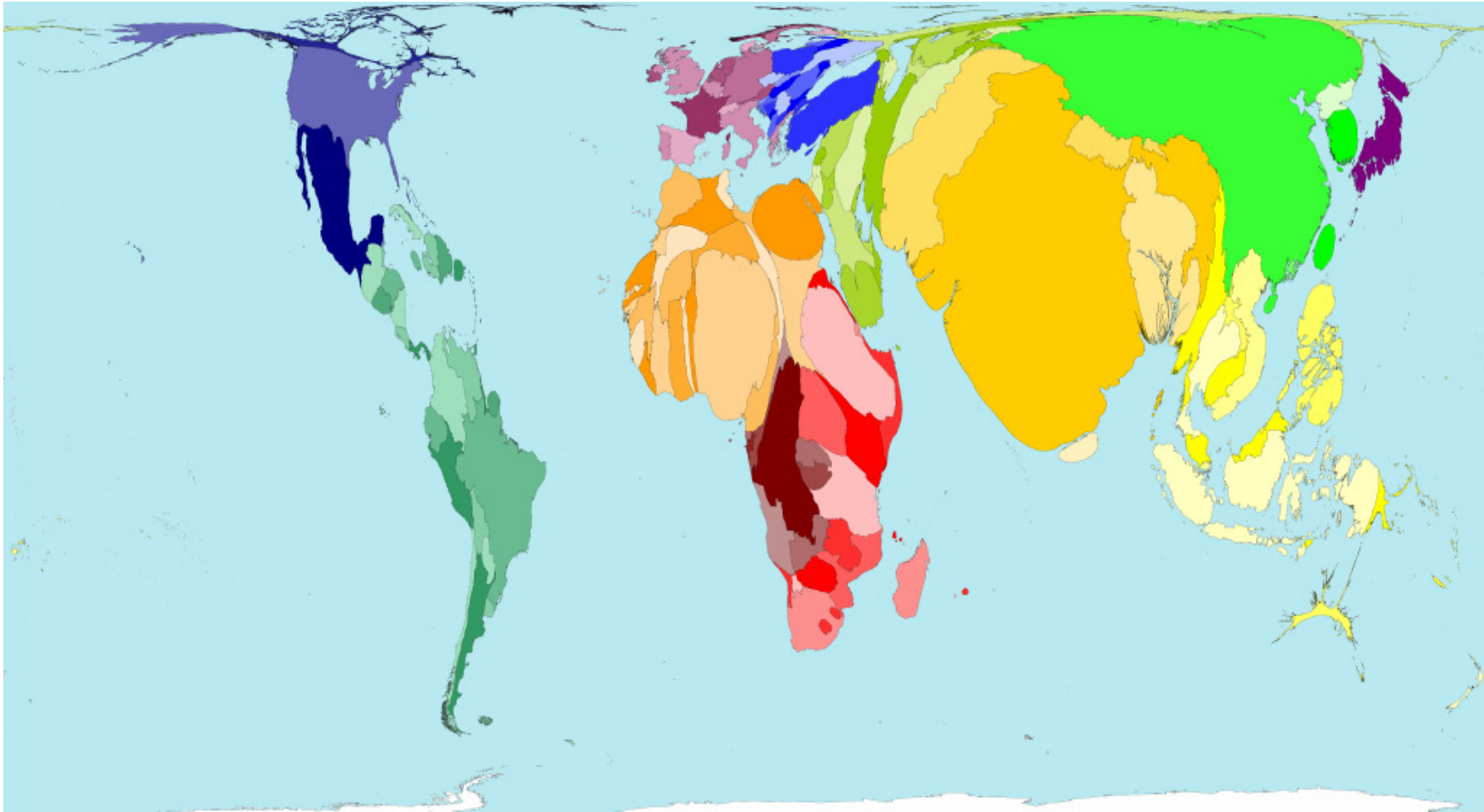


77.1 millions

World Map



World Map – Births by Region



Number of babies and place of birth

Country groups	Livebirths (millions)	Home births %	Home births (millions)
High income	11.0	Near zero	Near zero
L. America and Caribbean	11.4	14	1.6
South Asia	37.9	64	24.3
East Asia and Pacific	29.7	31	9.2
Middle East and N. Africa	8.9	32	2.8
CEE/CIS	6.1	11	0.7
Sub-Saharan Africa	29.9	64	19.1
All LMICs	124.0	47	57.7

Measurement problem

UNICEF Region	% of births NOT weighed at birth
South Asia	74
Sub-Saharan Africa	65
Middle East and North Africa	60
East Asia and Pacific	30
CEE/CIS	21
Latin America and Caribbean	17
Developing countries	58
Least developed countries	68

More than half (58%) of babies not weighed at birth and even less have reliable gestational age

What do we know about the prevalence of small babies in low and middle income countries?

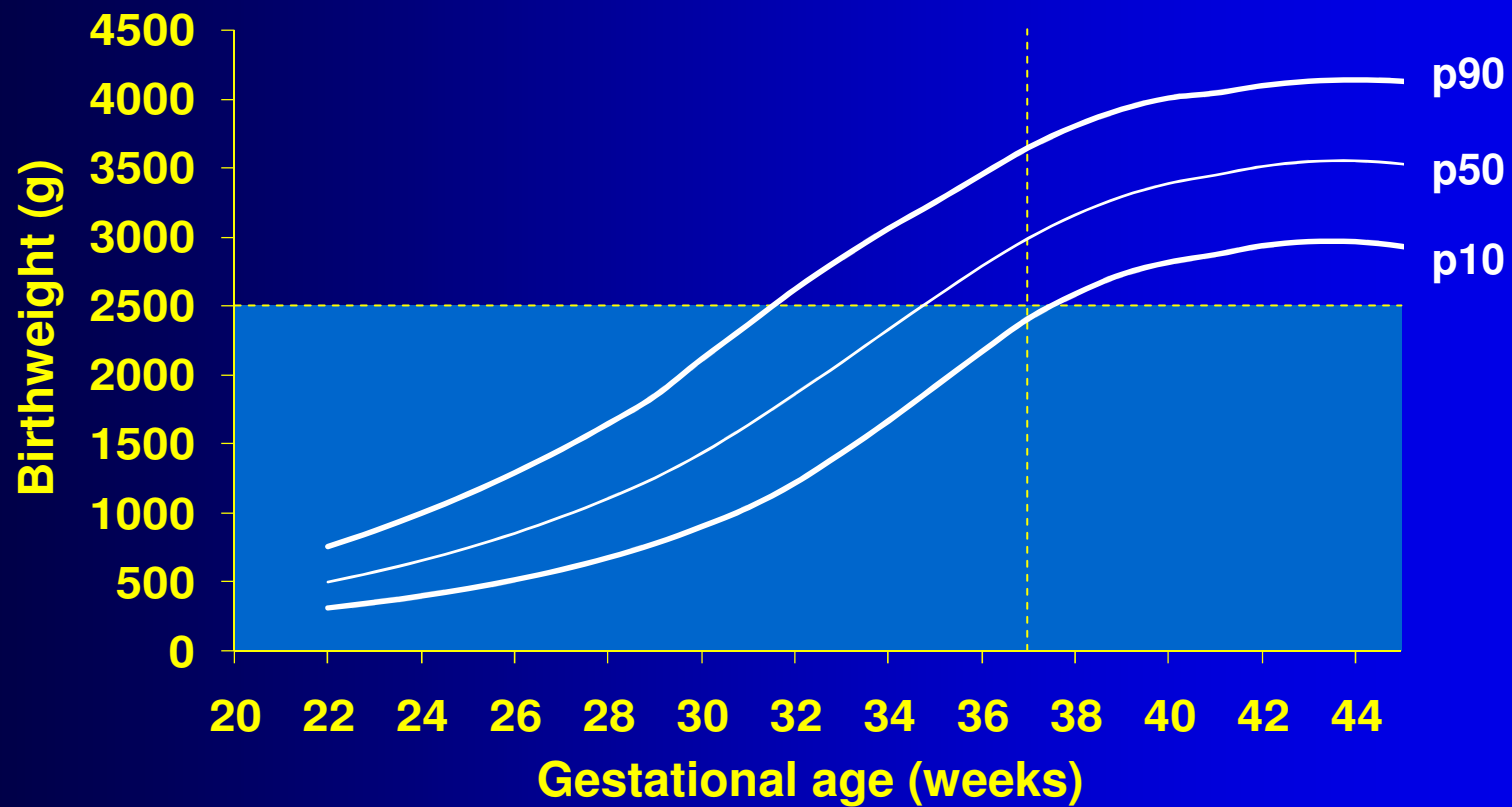
LOW BIRTHWEIGHT



COUNTRY,
REGIONAL AND
GLOBAL ESTIMATES



Birthweight and gestational age distribution



How many of the LBW babies
are preterm?

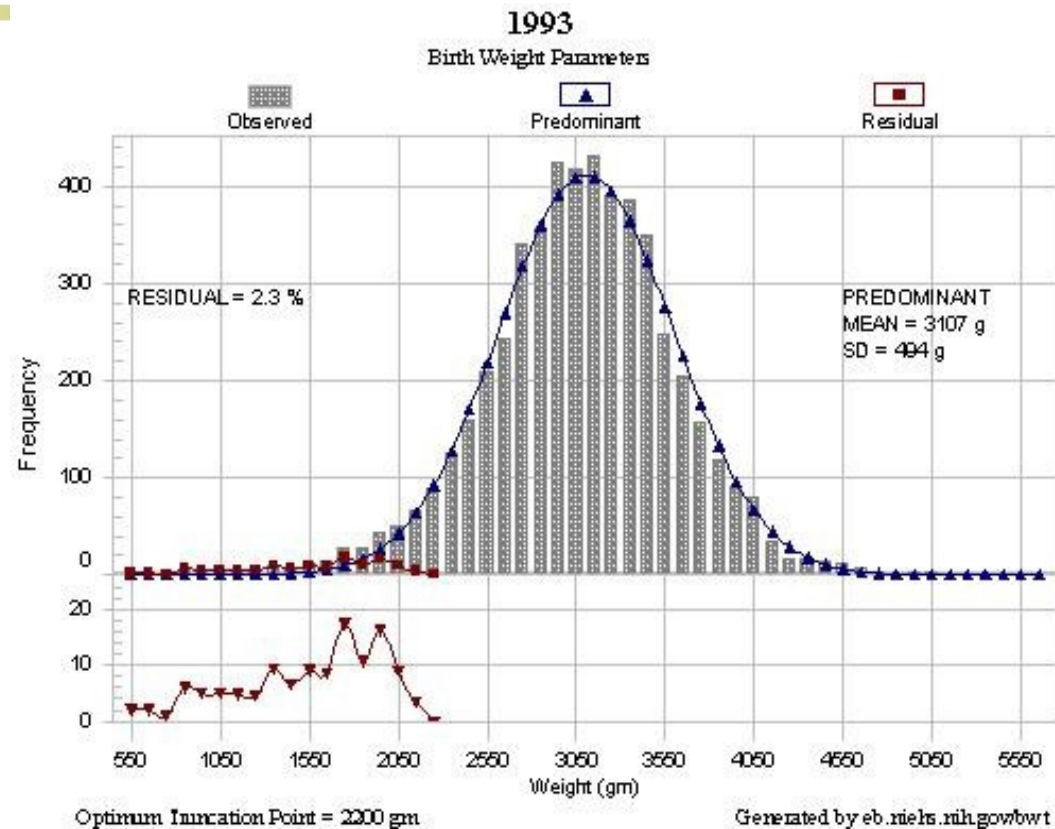
Estimates of preterm births

What to do if information on gestational age is not available?

If the birth weight distribution is available

It is possible to determine what is the predominant distribution and what is the residual (Allen Wilcox)

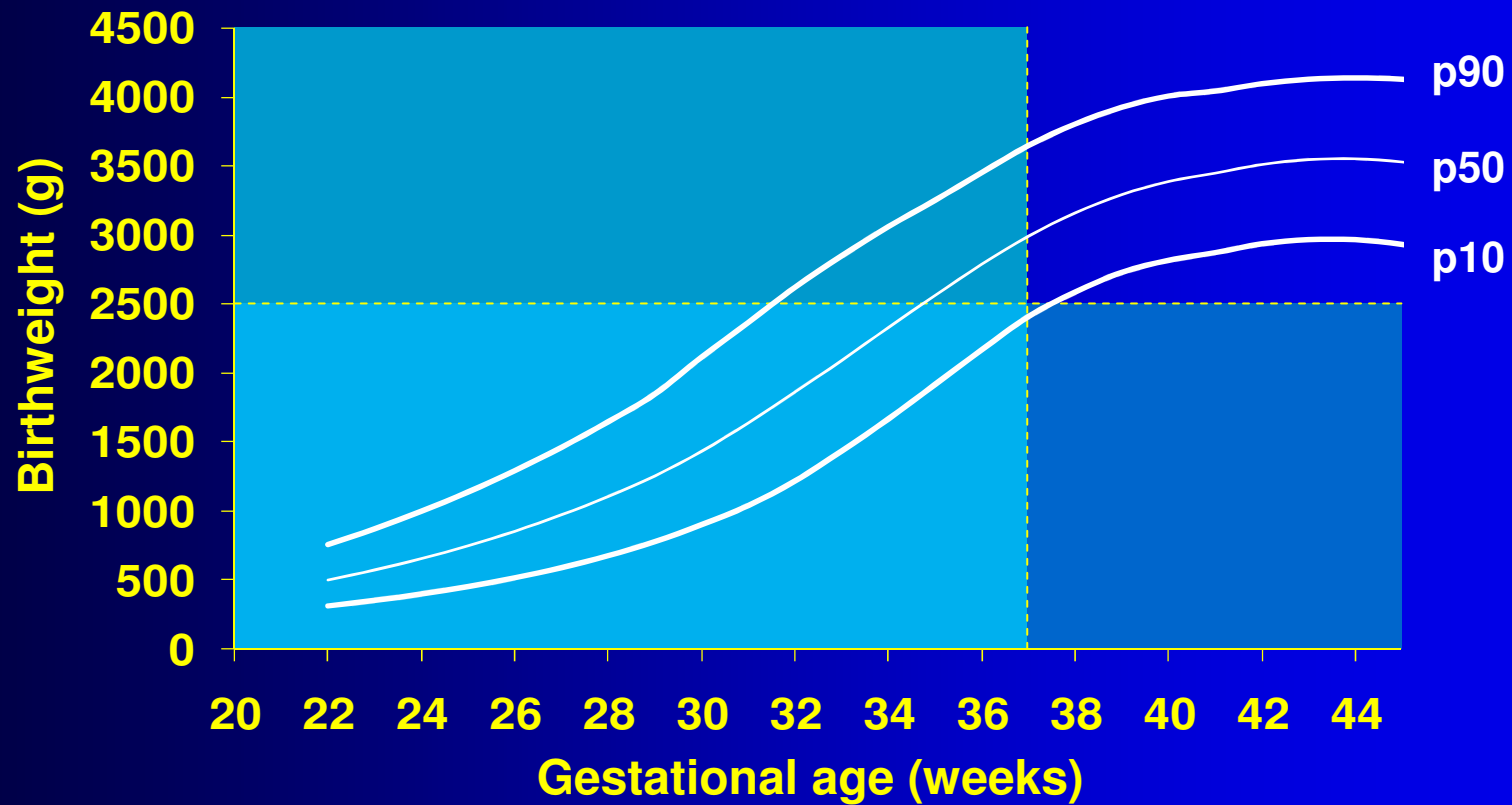
The predominant and residual in the birth weight distribution – Wilcox. Pelotas 1993.



If LBW is available

Use estimates of the prevalence of preterm and term babies in the LBW population (Villar, Belizán, de Onis)

Birthweight and gestational age



Correlation between LBW and term-LBW in developing countries, 1960-1977 (n=25)

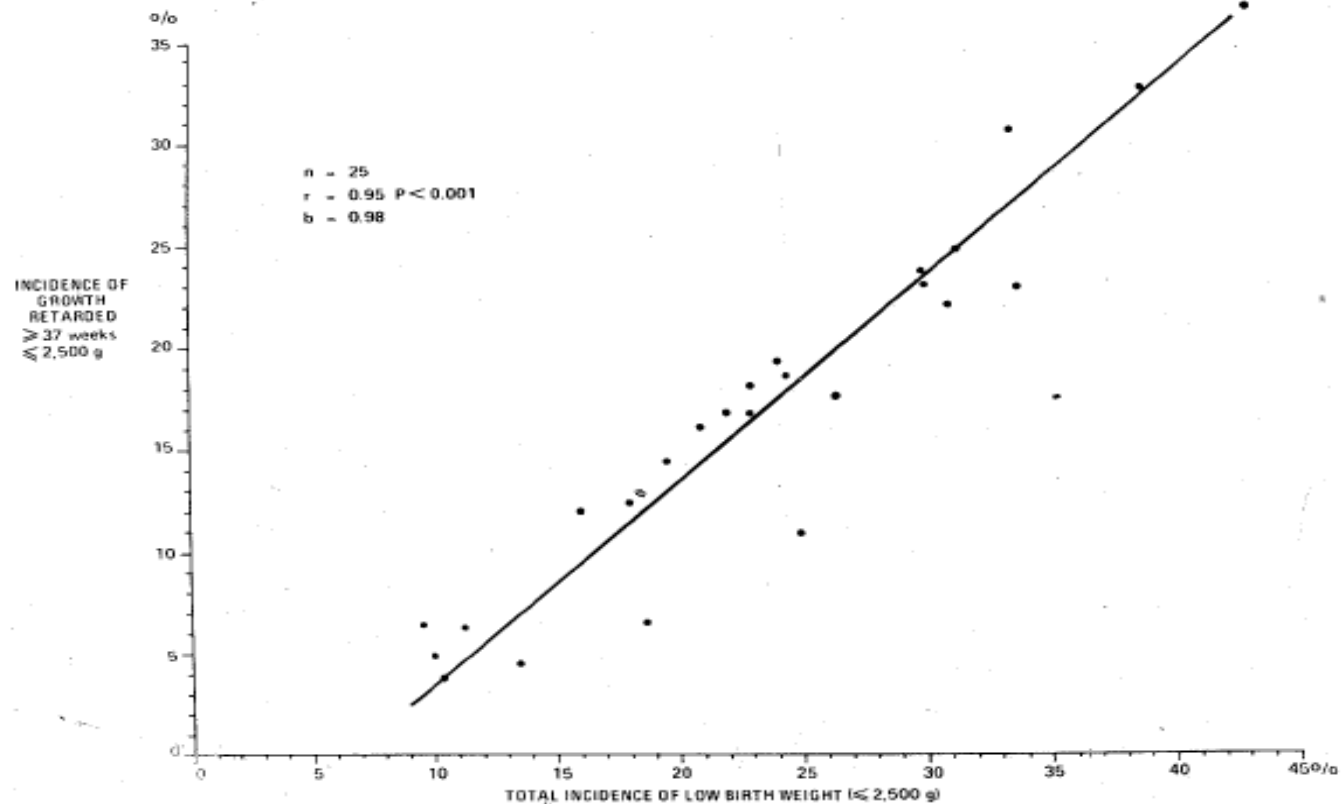


Fig. 1. Developing countries. Correlation between the overall incidence of LBW ($\leq 2,500$ gm) and the incidence of IUGR (≥ 37 weeks' gestation, $\leq 2,500$ gm). A significant correlation coefficient ($r = 0.95$; $p < 0.001$; $n = 25$) with a regression coefficient of 0.98 was found.

Correlation between LBW and LBW-PT in developing countries, 1960-1977 (n=25)

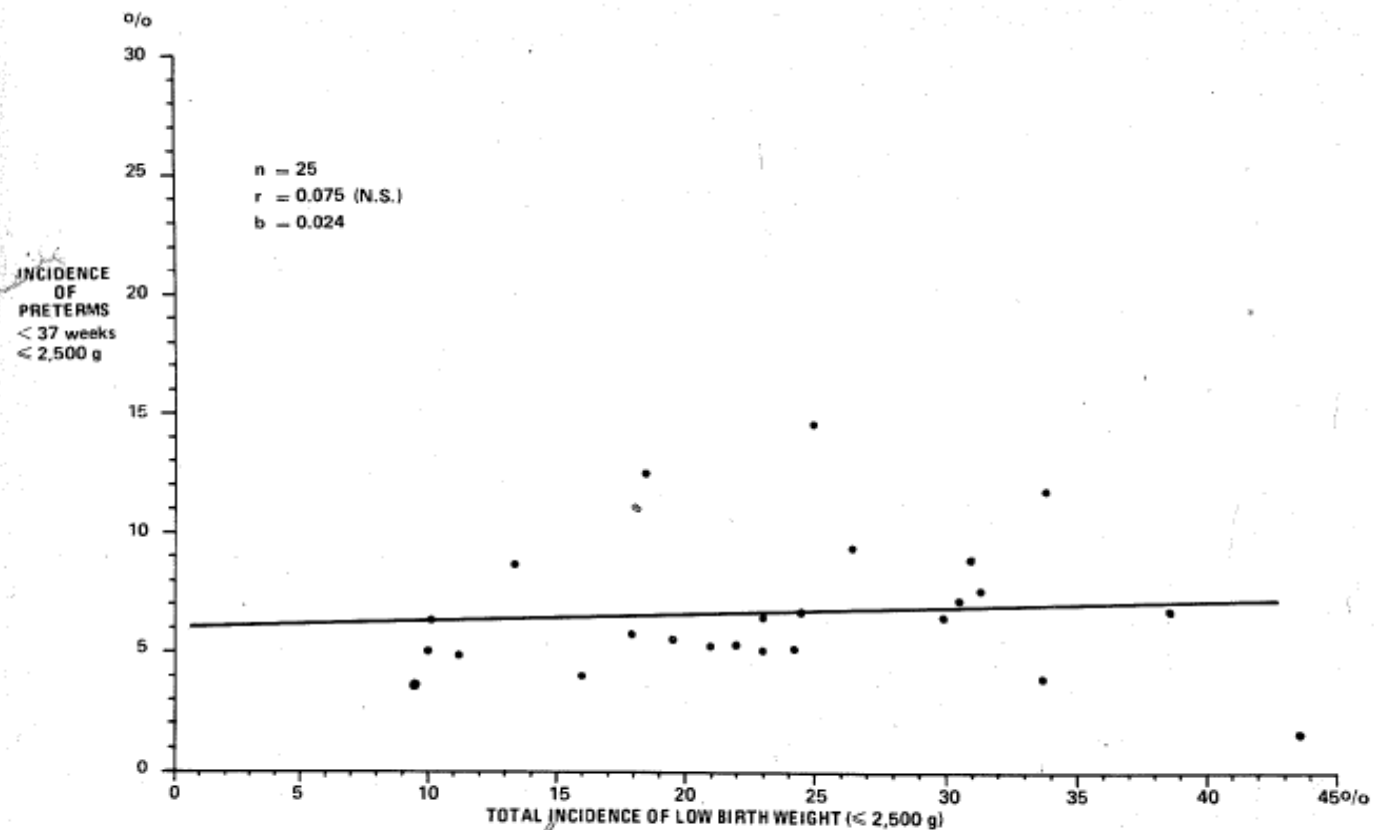
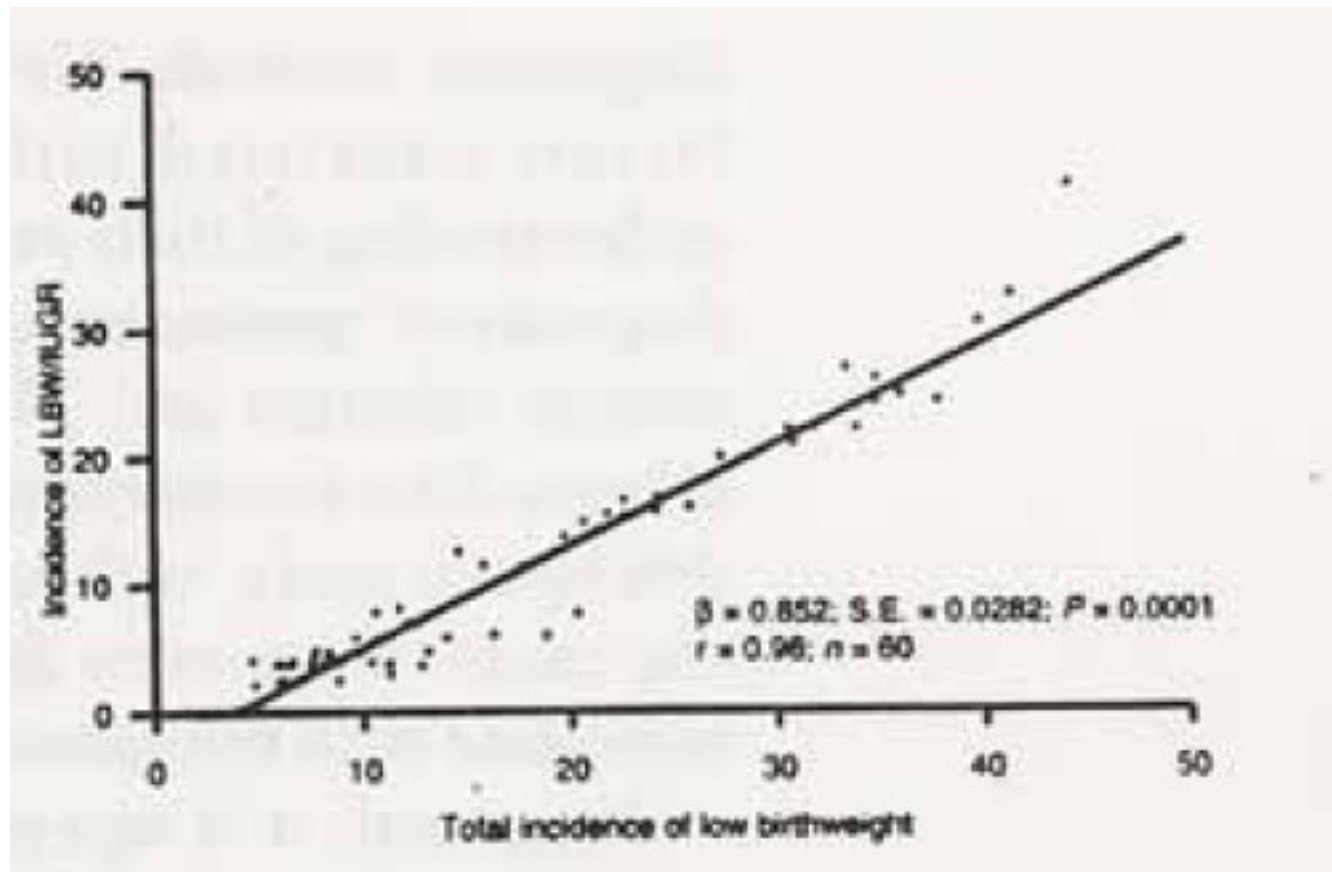


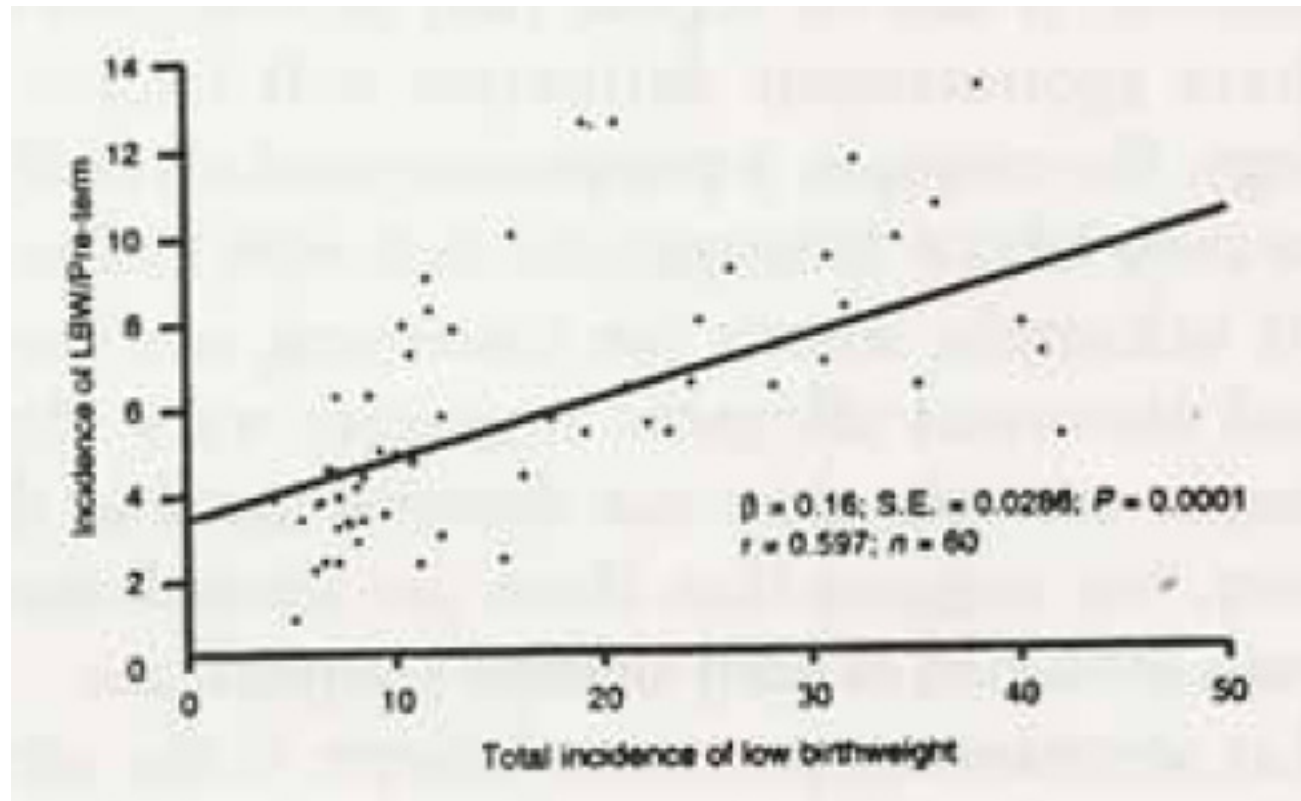
Fig. 2. Developing countries. Correlation between the overall incidence of LBW ($\leq 2,500$ gm) and the incidence of preterm babies (<37 weeks' gestation, $\leq 2,500$ gm). A nonsignificant correlation ($r = 0.075$; $n = 25$) was found.

Correlation between LBW and term-LBW in developing countries, 1960-1990 (n=60)



Villar et al, 1994

Correlation between LBW and LBW-PT in developing countries, 1960-1990 (n=60)



Maternal and Child Undernutrition 1

Maternal and child undernutrition: global and regional exposures and health consequences

*Robert E Black, Lindsay H Allen, Zulfiqar A Bhutta, Laura E Caulfield, Mercedes de Onis, Majid Ezzati, Colin Mathers, Juan Rivera, for the Maternal and Child Undernutrition Study Group**

Lancet, 2008

Estimates of LBW and term-LbW for LMICs

	Low birthweight (% <2500 g) ⁴⁵	IUGR-LBW (estimated %) ⁴⁰
Africa	14.3	8.89
Eastern	13.5	8.27
Middle	12.3	7.24
Northern	15.3	9.8
Southern	14.6	9.21
Western	15.4	9.89
Asia	18.3	12.39
Eastern	5.9	1.79
South-central	27.1	19.87
Southeastern	11.6	6.65
Western	15.4	9.89
Latin America	10	5.29
Caribbean	13.7	8.44
Central America	10.1	5.37
South America	9.6	4.94
All developing countries	16	10.81

IUGR-LBW=Intrauterine growth restriction-low birthweight.

Prevalence estimates of Term-LBW births in low and middle income countries (LMICs)

Region	Livebirths (millions)	LBW %	Term-LBW %	Term-LBW (millions)
Asia	80	18.3	12.4	9.7
Africa	32	14.3	8.9	2.7
Latin America	12	10.0	5.3	0.6
All LMICs	124	16.0	10.8	13

Prevalence estimates of PT-LBW births in low and middle income countries (LMICs)

Region	Livebirths (millions)	LBW %	PT-LBW %	PT-LBW (millions)
Asia	78	18.3	5.9	4.6
Africa	30	14.3	5.4	1.6
Latin America	12	10.0	4.7	0.6
All LMICs	120	16.0	5.2	6.8

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Is the predictive equation derived from studies conducted between 1960-90 still applicable?

Reasons for new studies in LMICs

LBW - IUGR and preterm births - may have changed in recent years

It appears that there are now more preterm babies and less IUGR in the LBW populations of LMICs

Prevalence of preterm and LBW in Pelotas, Brazil, 1982, 1993 and 2004

Year	LBW	Term-LBW	Preterm-LBW	PT \geq 2500 g
1982	9.0	5.2	3.8	2.5
1993	9.7	3.9	5.8	5.6
2004	10.0	3.2	6.8	7.9

63 studies with field work conducted after 1990

Latin America and the Caribbean – 11

South Asia – 16

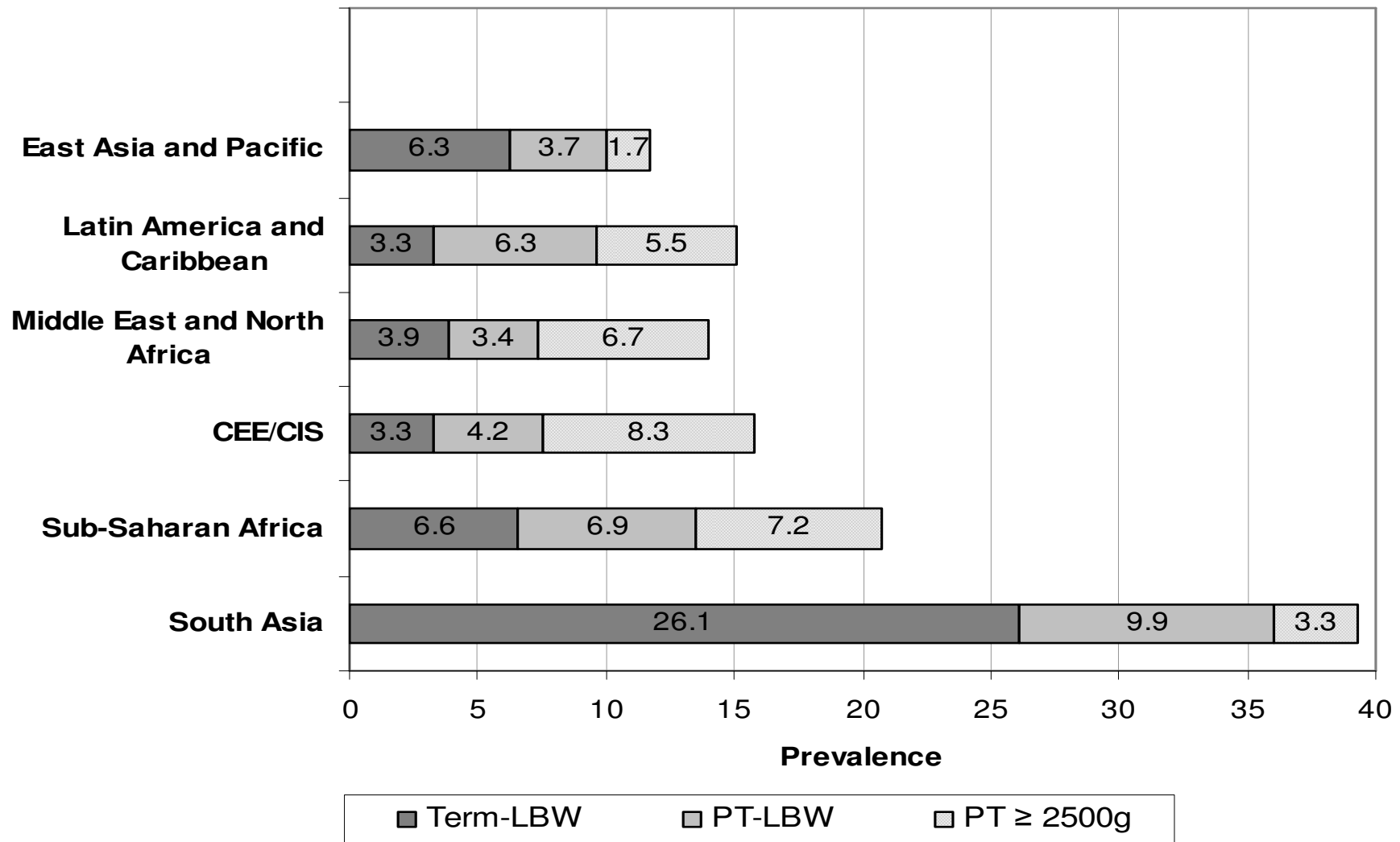
East Asia and Pacific – 5

Middle East and North Africa – 7

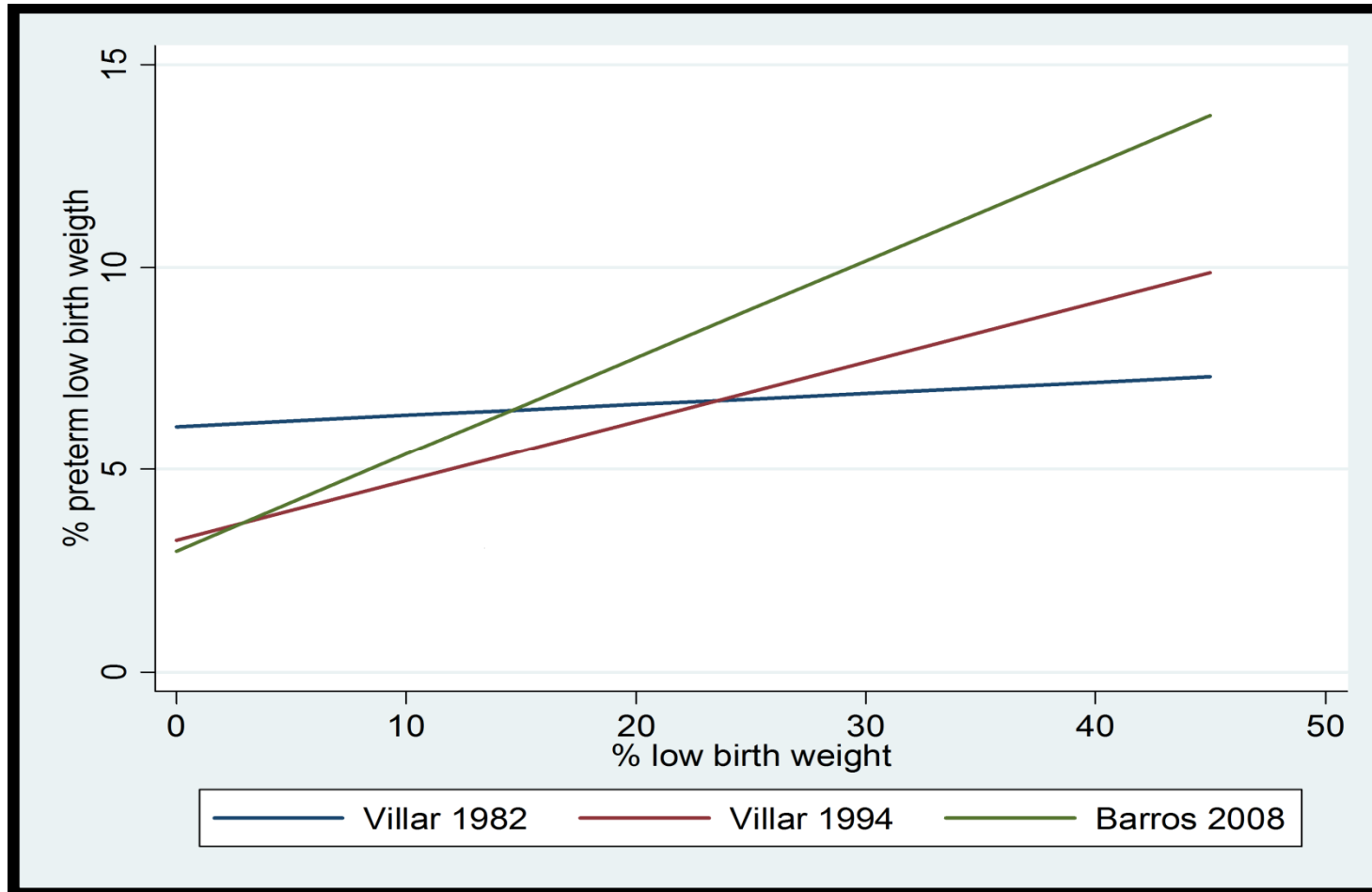
CEE/CIS – 3

Sub-Saharan Africa - 21

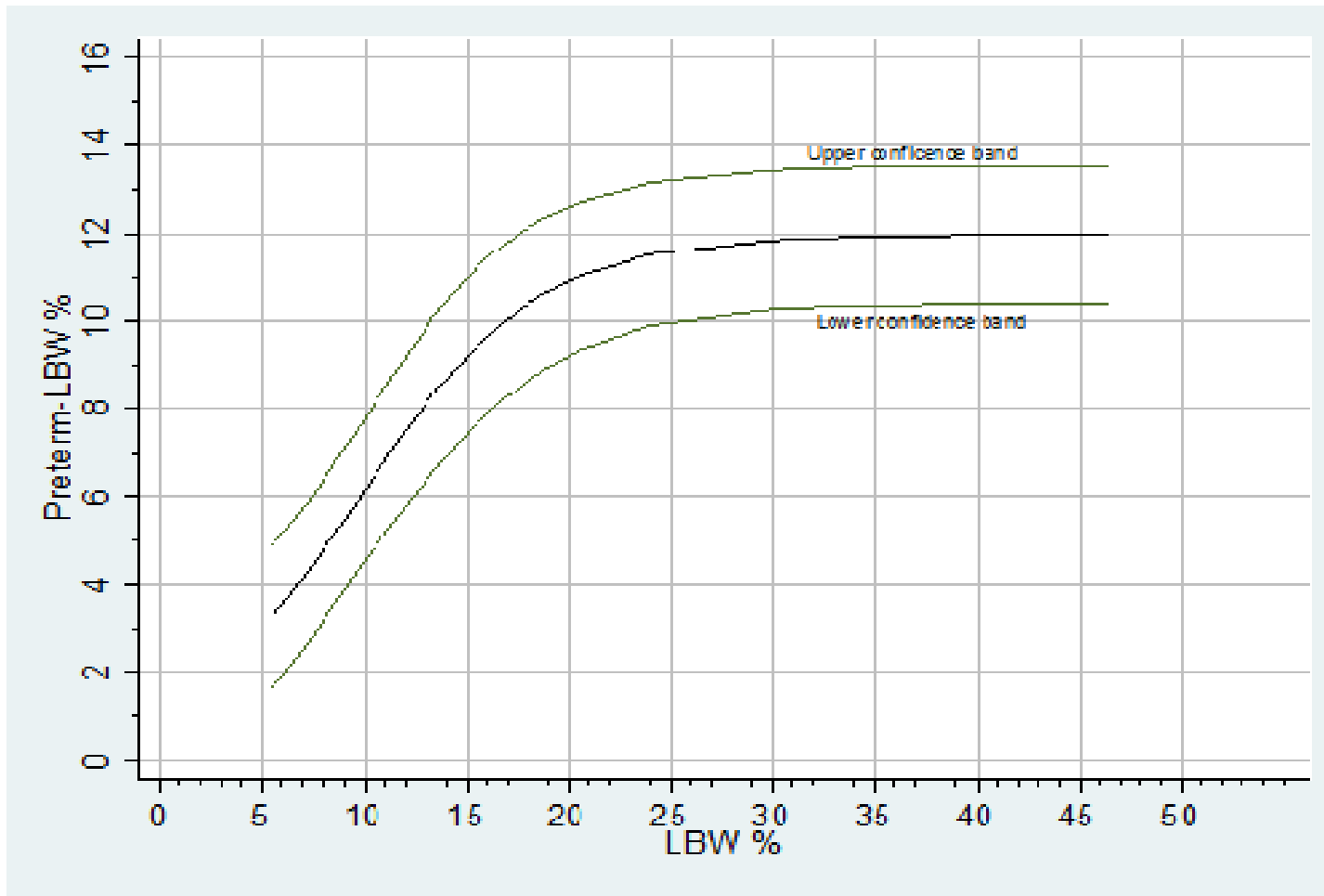
Median prevalence of term-LBW, preterm-LBW and preterm $\geq 2500\text{g}$ by region



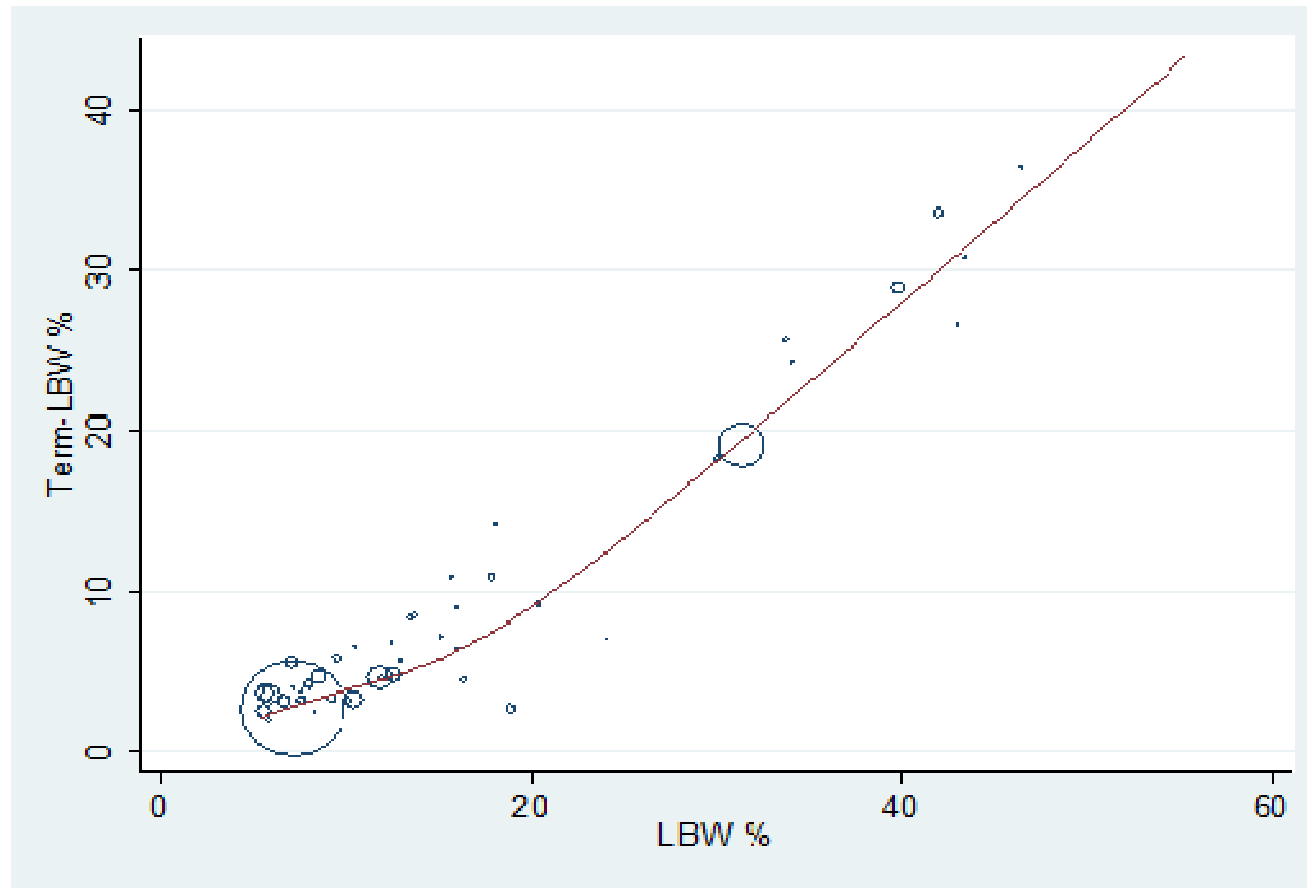
Regression lines of preterm-LBW by LBW



PT-LBW prevalence in relation to LBW



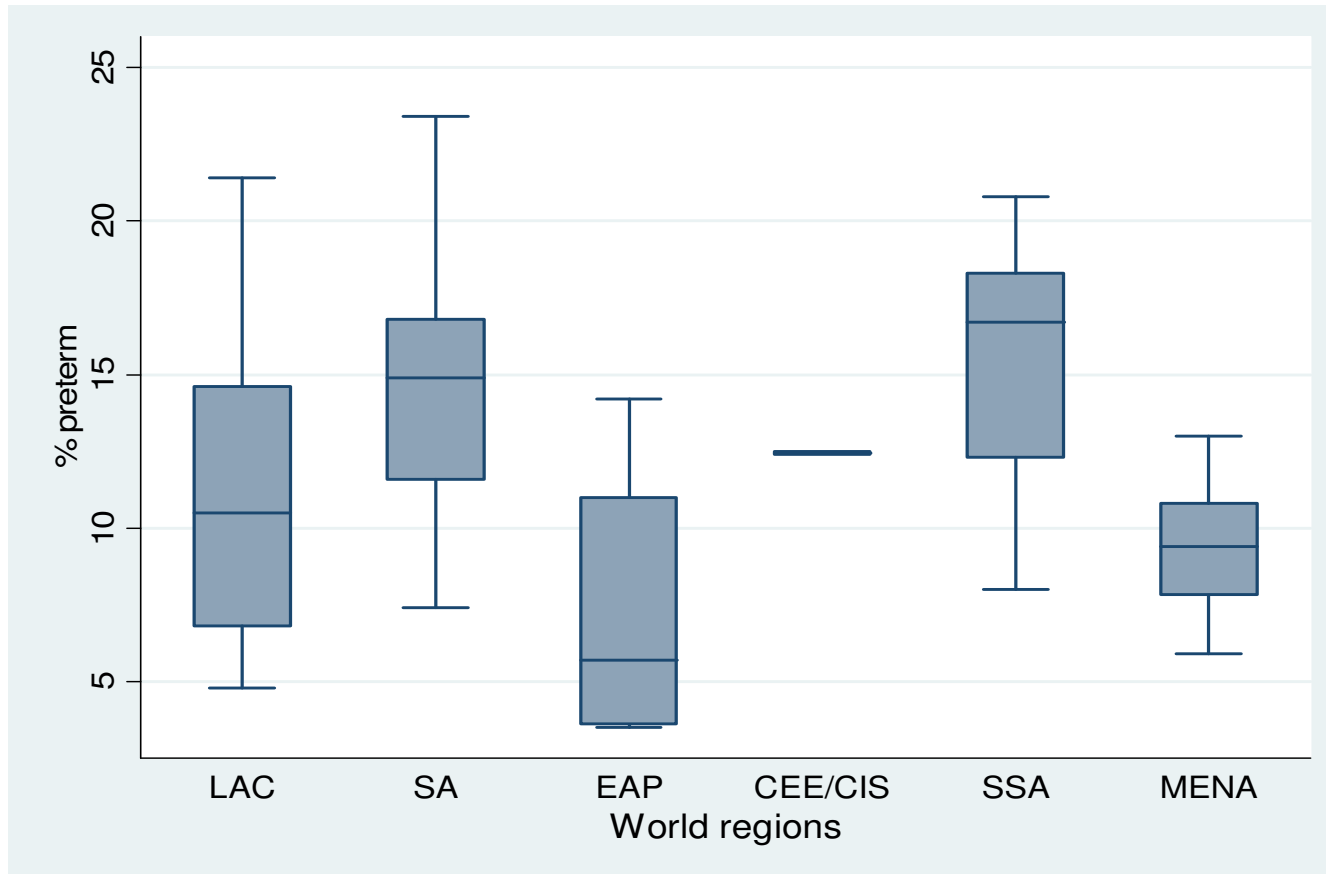
Term-LBW prevalence in relation to LBW



Countries	Births (millions)	LBW %	Term- LBW %	PT-LBW %	PT-LBW (millions)
High income	11.0	7.0	2.9	4.1	0.7
L America Caribbean	11.4	9.9	3.8	6.1	0.7
South Asia	37.9	28.1	16.0	12.1	4.6
East Asia Pacific	29.7	8.2	3.4	4.8	1.4
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CEE/CIS	6.1	8.5	3.5	5.0	0.3
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All LMICS	124.0	16.4	8.1	8.3	10.2

Estimated prevalence of preterm births in LMICs



Preterm births in LMICs – a summary

Difficult to measure

It seems to be increasing

Causes of increase not known

Few, if any, effective preventive measures

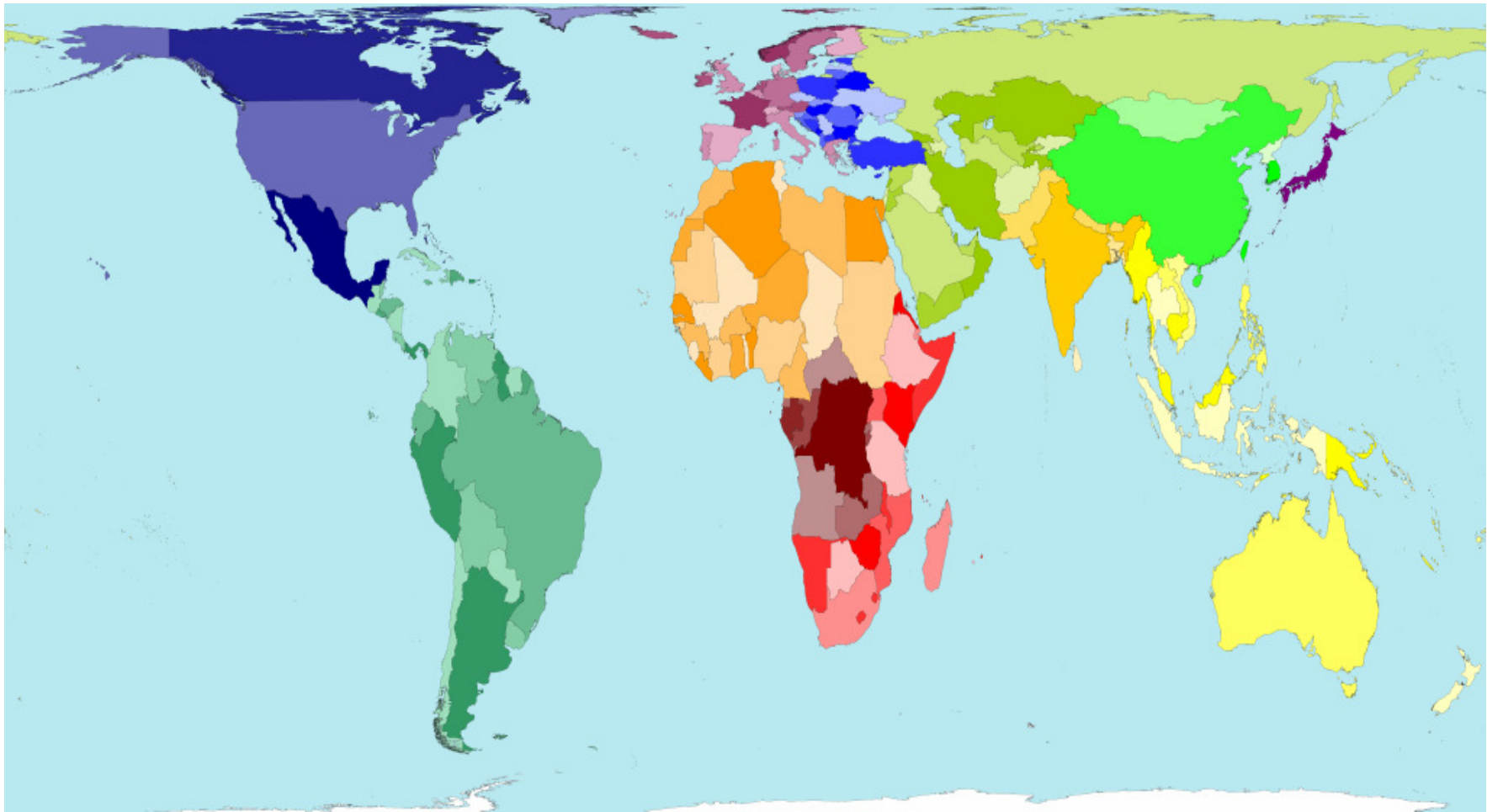
Major cause of death and disability

Research needs on preterm births in LMICs

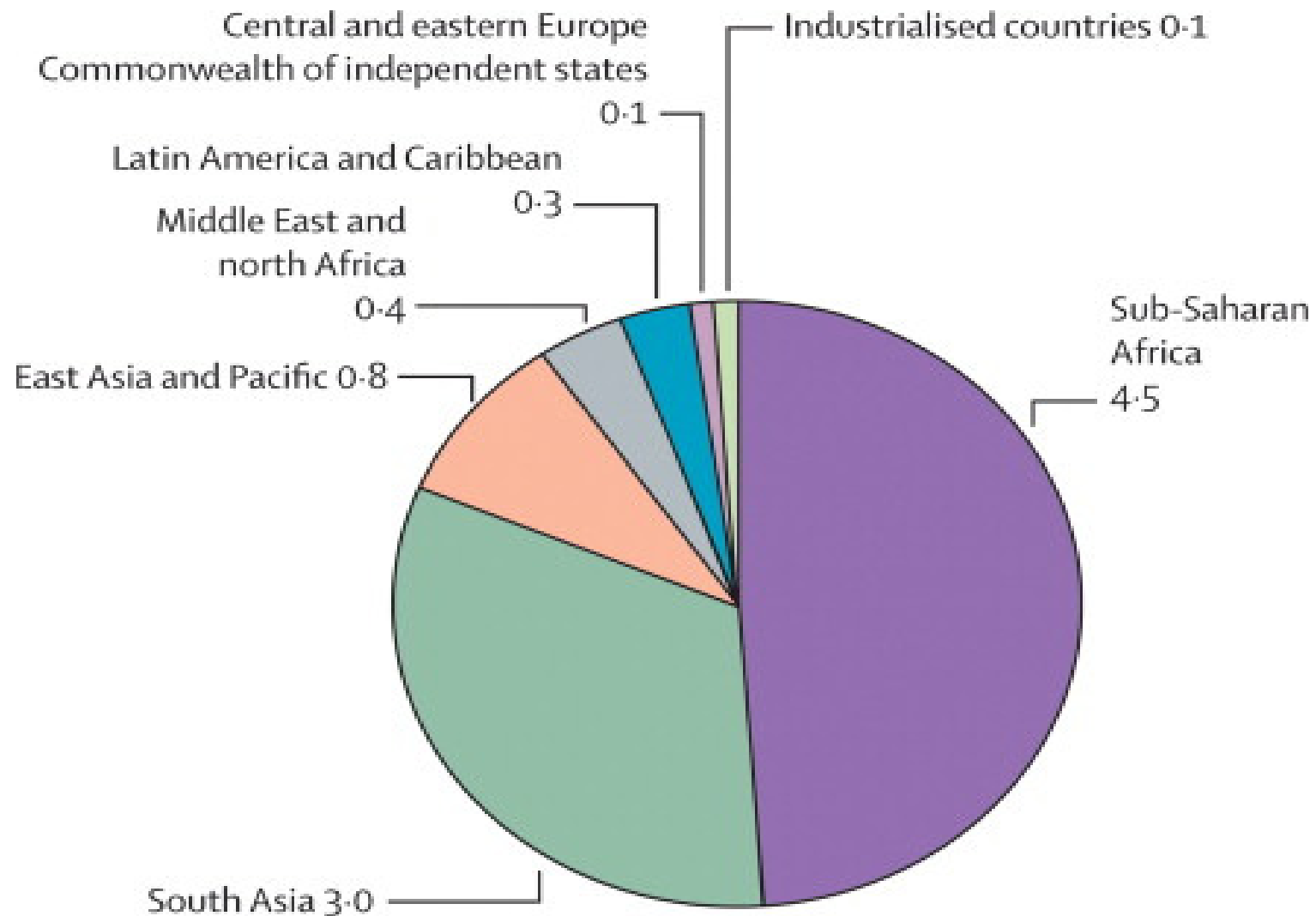
- Better etiologic research for subtypes of preterms in different settings
- Identification of preventive interventions
- Research on scaling up the few known effective interventions
- Simple, reliable and cheap methods for diagnosing preterm babies in low income settings

The greatest need in LMICs

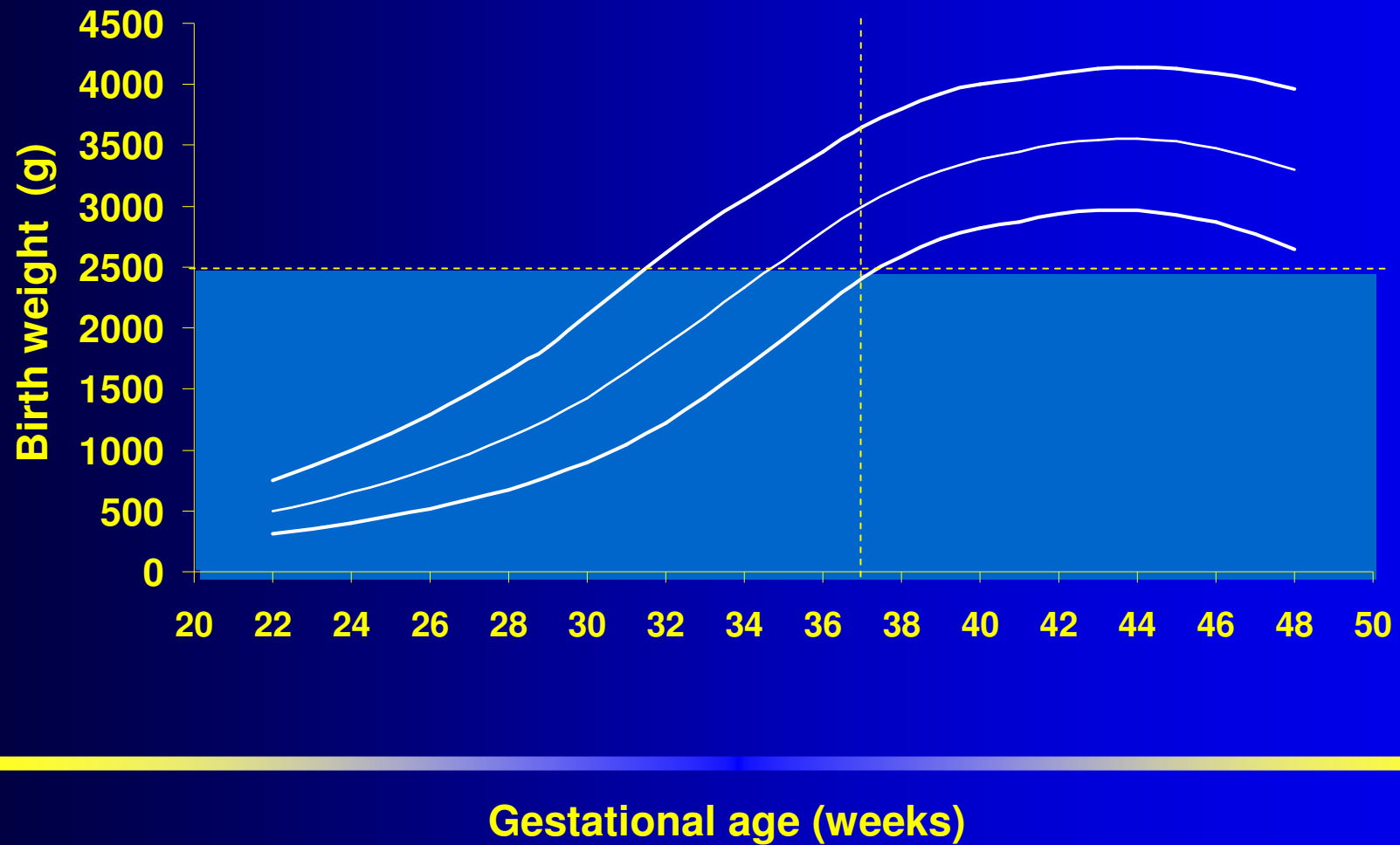
Provide skilled attendance during pregnancy, labor, delivery and in the first days of life, especially in South Asia and Sub-Saharan Africa



Regional distribution of the 9.2 million children who died in 2007 before they reached their fifth birthday



Birth weight for gestational age



Birth weight for gestational age

